Tsi12M

Tenkasi District

Common Second Revision Examination - 2025

03-02-25

Standard 12

MATHEMATICS

Time: 3.00 Hours Marks: 90

Part - I

Note: **i) All questions are compulsory.** **20x1=20**

ii) Choose the correct or most suitable answer from the given four alternatives. Write the option code and the corresponding answer.

1) If A is a 3 × 3 matrix such that |3 adj A| = 3 then |A| is equal to

a) $\frac{1}{3}$ b) $\frac{-1}{3}$ c) $\pm\frac{1}{3}$ d) ± 3

2) If $A = \begin{bmatrix} 1 & \tan\frac{\theta}{2} \\ -\tan\frac{\theta}{2} & 1 \end{bmatrix}$ and $AB=I_2$, then B =

a) $\left(\cos^2\frac{\theta}{2}\right)A$ b) $\left(\cos^2\frac{\theta}{2}\right)A^T$ c) $\left(\cos^2\theta\right)I$ d) $\left(\sin^2\frac{\theta}{2}\right)A$

3) If $\left|z-\frac{3}{2}\right|=2$, then the least value of |z| is

a) 1 b) 2 c) 3 d) 5

4) If α and β are the roots of $x^2+x+1=0$, then $\alpha^{2020}+\beta^{2020}$ is

a) −2 b) −1 c) 1 d) 2

5) A zero of x^3+64 is

a) 0 b) 4 c) 4i d) −4

6) The polynomial x^3-kx^2+9x has three real zeros if and only if, k satisfies,

a) $|k|\le 6$ b) k = 0 c) |k|>6 d) $|k|\ge 6$

7) If $\cot^{-1}x = \frac{2\pi}{5}$ for some $x\in R$, then value of $\tan^{-1}x$ is

a) $\frac{-\pi}{10}$ b) $\frac{\pi}{5}$ c) $\frac{\pi}{10}$ d) $\frac{-\pi}{5}$

8) The vertex of the parabola $x^2=8y-1$ is

a) $\left(-\frac{1}{8},0\right)$ b) $\left(\frac{1}{8},0\right)$ c) $\left(-6,\frac{9}{2}\right)$ d) $\left(\frac{9}{2},-6\right)$

9) The eccentricity of the ellipse $(x-3)^2+(y-4)^2=\frac{y^2}{9}$ is

a) $\frac{\sqrt{3}}{2}$ b) $\frac{1}{3}$ c) $\frac{1}{3\sqrt{2}}$ d) $\frac{1}{\sqrt{3}}$

10) If the direction cosines of a line $\frac{1}{c},\frac{1}{c},\frac{1}{c}$, then

a) $c=\pm 3$ b) $c=\pm\sqrt{3}$ c) c >0 d) 0<c<1

11) If $\vec{a},\vec{b},\vec{c}$ are three non-coplanar vectors such that $\vec{a}\times(\vec{b}\times\vec{c})=\frac{\vec{b}+\vec{c}}{\sqrt{2}}$, then the angle between $\vec{a}$ and $\vec{b}$ is

a) $\frac{\pi}{2}$ b) $\frac{3\pi}{4}$ c) $\frac{\pi}{4}$ d) π

12) The value of $\int_{-\pi/2}^{\pi/2} \sin^2 x + \cos x \, dx$ is

a) $3/2$ b) $1/2$ c) $2/3$ d) 0

13) The maximum value of the functions. x^2e^{-2x}, $x > 0$ is

a) $\frac{1}{e}$ b) $\frac{1}{2e}$ c) $\frac{1}{e^2}$ d) $\frac{4}{e^4}$

14) If $u(x, y) = x^2+3xy+y-2019$, then $\left.\frac{\partial u}{\partial x}\right|_{(4,-5)}$ is

a) −4 b) −3 c) −7 d) 13

15) The intergrating factor of the differential equation $\frac{dy}{dx} + y = \frac{1+y}{\lambda}$ is

a) $\frac{x}{e^{\lambda}}$ b) $\frac{e^{\lambda}}{x}$ c) λe^x d) e^x

16) The order and degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{1/3} + x^{1/4} = 0$ are respectively

a) 2, 3 b) 3, 3 c) 2, 6 d) 2, 4

17) Subtraction is not a binary operation in

a) R b) Z c) N d) Q

18) If $a * b = \sqrt{a^2 + b^2}$ on the real number then * is

a) commutative but not associative b) associative but not commutative
c) both commutative and associative d) neither commutative nor associative

19) If $f(x) = \begin{cases} 2x, & 0 \le x \le a \\ 0 & \text{otherwise} \end{cases}$, is a probability density function of a random variable, then the value of a is

a) 1 b) 2 c) 3 d) 4

20) A random variable X has binomial distribution with n = 25 and P = 0.8 then standard deviation of X is

a) 6 b) 4 c) 3 d) 2

Part - II

Note: i) **Answer any 7 questions.**
ii) **Q.No. 30 is compulsory.** **7x2=14**

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21) If $\text{adj}(A) = \begin{bmatrix} 0 & -2 & 0 \\ 6 & 2 & -6 \\ -3 & 0 & 6 \end{bmatrix}$, find A^{-1}

22) If $|z| = 2$, show that $3 \le |z + 3 + 4i| \le 7$

23) Solve the equation: $x^4-14x^2+45 = 0$

24) For what value of x does $\sin x = \sin^{-1}x$?

25) Find the equations of tangent to the parabola $x^2+6x+4y+5=0$ at $(1, -3)$

26) Find the vector and Cartesian equations of the plane passing through the point with position. Vector $2\vec{i} + 6\vec{j} + 3\vec{k}$ and normal to the vector $\vec{i} + 3\vec{j} + 5\vec{k}$

27) Evaluate: $\lim_{x \to 0}\left(\frac{1}{\sin x} - \frac{1}{x}\right)$

28) Show that $F(x, y) = \frac{x^2 + 5xy - 10y^2}{3x + 7y}$ is a homogeneous function of degree 1

29) Show that $x^2+y^2=r^2$, where r is a constant, is a solution of the differential equation $\frac{dy}{dx} = \frac{-x}{y}$

30) Let $m = \left\{\begin{pmatrix} a & 0 \\ 0 & 0 \end{pmatrix} : a \in R - \{0\}\right\}$ and let * be the matrix multiplication. Determine whether m is closed under *. If so, examine the existence of identity, existence of inverse properties for the operation * on m.

Part - III

Note: i) Answer any 7 questions. **7x3=21**
ii) Q.No. 40 is compulsory.

31) In a competitive examination, one mark is awarded for every correct answer white $\frac{1}{4}$ mark is deducted for every wrong answer. A student answered 100 questions and got 80 marks. How many questions did he answer correctly? (Use Cramer's rule to solve the problem)

32) If z=x+iy is a complex number such that $\left|\frac{z-4i}{z+4i}\right| = 1$ show that the locus of z is real axis

33) If p and q are the roots of the equation $lx^2+nx+n=0$, show that $\sqrt{\frac{p}{q}} + \sqrt{\frac{q}{p}} + \sqrt{\frac{n}{l}} = 0$

34) Find the vertices, foci for the hyperbola $4x^2-36y^2=144$.

35) Find the magnitude and the direction cosines of the torque about the point (2, 0, −1) of a force $2\vec{i} + \vec{j} - \vec{k}$, whose line of action passes through the origin.

36) Show that $p \to q$ and $q \to p$ are not equivalent.

37) Find the volume of a sphere of radius a.

38) Assume that a spherical rain drop evaporates at a rate proportional to its surface area. Form a differential equation involving the rate of change of the radius of the rain drop

39) The mean and standard deviation of a binomial variatex are respectively 6 and 2. Find (i) The probability mass function (ii) $P(x \geq 2)$

40) If $\cot^{-1}\left(\frac{1}{7}\right) = \theta$, find the value of $\cos\theta$

Part - IV

Answer all the questions. **7x5=35**

41) a) By using Gaussian elimination method, balance the chemical equation:
$C_2H_6HO_2 \rightarrow H_2O + CO_2$

(OR)

b) A hollow cone with base radius a cm and height b cm is placed on a table. Show that the volume of the largest cylinder that can be hidden underneath is $\frac{4}{9}$ times volume of the cone.

42) a) If $z = x + iy$ and $\arg\left(\frac{z-i}{z+2}\right) = \frac{\pi}{4}$, show that $x^2+y^2+3x-3y+2=0$

(OR)

b) If $u = \sec\left(\frac{x^3-y^3}{x+y}\right)$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2\cot u$

43) a) Find the area of the region bounded between the curves $y = \sin x$ and $y = \cos x$ and the lines $x = 0$ and $x = \pi$

(OR)

b) Solve the following equation. $x^4-10x^3+26x^2-10x+1 = 0$

44) a) Prove that $\tan(\sin^{-1}x) = \frac{x}{\sqrt{1-x^2}}$, $-1<x<1$.

(OR)

b) Suppose a person deposits ₹10,000 in a bank account at the rate of 5% per annum compounded continuously. How much money will be in his bank account 18 months later?

45) a) A retailer purchases a certain kind of electronic device from a manufacturer. The manufacturer indicates that the defective rate of the device is 5%. The inspector of the retailer randomly picks 10 items from a shipment. What is the probability that there will be (i) at least one defective item (ii) exactly two decfective items?

(OR)

b) Find the equation of the circle passing through the points (1,1) (2, −1) and (3, 2)

46) a) A rod of length 1.2m moves with its ends always touching the coordinate axes. The locus of a point P on the rod, which is 0.3m from the end in contact with x-axis is an ellipse. Find the eccentricity.

(OR)

b) Find the point of intersection of the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$

47) a) Let A be Q\{1}. Define * on A by $x * y = x + y - xy$. If * binary on A? If so, examine (i) commutative properties (ii) associative properties (iii) existence of identity (iv) existence of inverse properties for the operation * on A

(OR)

b) Prove by vector method that the perpendicular from the vertices to the opposite sides of a triangle are concurrent.

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